Electronic Version
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Claims

[c1] What is claimed is:

1.A method for forming a deep trench capacitor buried plate comprising:

providing a substrate having a pad oxide layer and a pad nitride layer thereon, the pad oxide layer and the pad nitride layer having at least an opening;

performing a dry etching process for forming a deep trench in the substrate via the opening;

depositing a doped silicate glass film on an inner wall of the deep trench;

filling a sacrificial layer into the deep trench;

etching back the sacrificial layer for exposing parts of the doped silicate glass film;

removing the exposed doped silicate glass film;

removing the remaining sacrificial layer;

depositing a silicon nitride layer on the inner wall of the deep trench;

performing a thermal process for forming a doped region at a bottom of the trench;

removing the silicon nitride layer; and

removing the doped silicate glass film;

wherein the silicon nitride layer serves as a barrier layer

for preventing ions of the doped silicate glass film from diffusing into a collar region of the deep trench.

[c2] 2.The method of claim 1 wherein the doped silicate glass film is an arsenic silicate glass (ASG) film.

[c3] 3.The method of claim 2 wherein the arsenic silicate glass film is formed by a chemical vapor deposition (CVD) process.

[c4] 4.The method of claim 1 wherein the silicon nitride layer is formed by a chemical vapor deposition process.

[c5] 5.The method of claim 1 wherein the doped silicate glass film is removed by an anisotropic etching process.

[c6] 6.The method of claim 1 wherein the silicon nitride layer is removed by an anisotropic etching process.

[c7] 7.A method for forming a deep trench capacitor buried plate comprising:
providing a substrate having a pad oxide layer and a pad nitride layer thereon, the pad oxide layer and the pad nitride layer having at least an opening;
performing a dry etching process for forming a deep trench in the substrate via the opening;
depositing a doped silicate glass film on an inner wall of the deep trench;

filling a sacrificial layer into the deep trench;
removing a portion of the sacrificial layer for exposing parts of the doped silicate glass film;
performing an etching process to remove the exposed doped silicate glass film and a portion of the pad nitride layer for forming a recess;
removing the remaining sacrificial layer;
depositing a silicon nitride layer on the inner wall of the deep trench;
performing a diffusing process for forming a doped region at a bottom of the trench;
removing the silicon nitride layer; and
removing the doped silicate glass film;
wherein the silicon nitride layer serves as a barrier layer for preventing ions of the doped silicate glass film from diffusing into a collar region of the deep trench.

[c8] 8.The method of claim 7 wherein the doped silicate glass film is an arsenic silicate glass (ASG) film.

[c9] 9.The method of claim 8 wherein the arsenic silicate glass film is formed by a chemical vapor deposition (CVD) process.

[c10] 10.The method of claim 7 wherein the silicon nitride layer is formed by a chemical vapor deposition process.

[c11] 11.The method of claim 7 wherein the etching process is an anisotropic etching process.

[c12] 12.The method of claim 7 wherein the silicon nitride layer is removed by an anisotropic etching process.